

## Iodine Hall Thruster for Space Exploration, Phase I

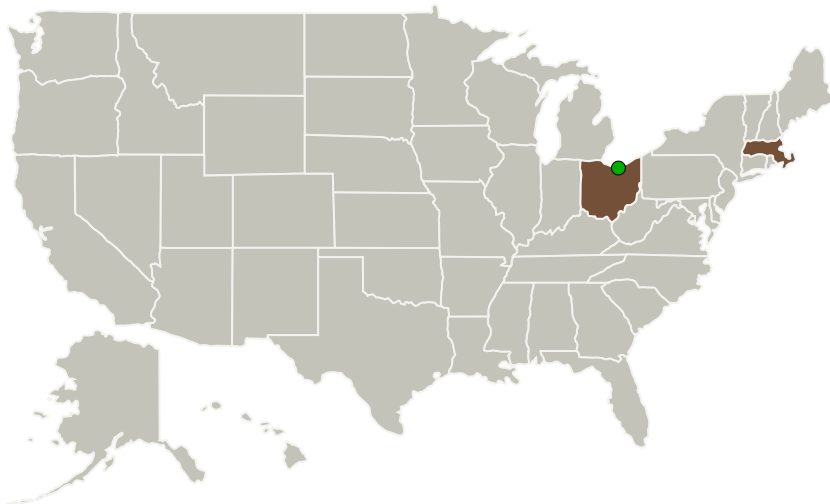
Completed Technology Project (2012 - 2012)



## Project Introduction

Busek Co. Inc. proposes to develop a high power (high thrust) electric propulsion system featuring an iodine fueled Hall Effect Thruster (HET). The system to be developed will include a thruster, hollow cathode, and condensable propellant feed system. The nominal power level of the thruster developed in this program will be 20 to 50 kW. The thruster can be clustered to support ~200 kW class missions to the moon, Mars, and beyond. In a future program, the technology can be scaled to ~100 kW per thruster to support MW-class missions. The available specific impulse can be throttled between 1500s to will be as high as 3000 to 4000 s. The use of iodine propellant enables significant mass and cost savings for lunar and Mars cargo missions, including Earth escape and near-Earth space maneuvers. High purity iodine is readily available commercially in large quantities at a fraction of the cost of xenon. Iodine stores at a density that is 3 times greater than xenon and at less than one thousandth of the pressure. Thus, iodine may be stored in low volume, low mass, low cost propellant tanks instead of the relatively large, high pressure, high cost COPV tanks required for xenon Hall thruster systems. Busek has already demonstrated a low power (several hundred watts) iodine thruster system based upon its flight qualified BHT-200 thruster. At most points, the efficiency are the same or nearly the same given experimental uncertainty. However, iodine may have a significant performance advantage at high power: Iodine yielded significantly higher specific impulse and thrust to power at higher input power. This effect will be investigated with the proposed high power system.

## Primary U.S. Work Locations and Key Partners



Iodine Hall Thruster for Space Exploration, Phase I

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

## Iodine Hall Thruster for Space Exploration, Phase I

Completed Technology Project (2012 - 2012)



Organizations Performing Work	Role	Type	Location
Busek Company, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Natick, Massachusetts
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

## Primary U.S. Work Locations

Massachusetts	Ohio
---------------	------

## Project Transitions

**February 2012:** Project Start**August 2012:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140306>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Busek Company, Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

James Szabo

**Co-Investigator:**

James Szabo

# Iodine Hall Thruster for Space Exploration, Phase I

Completed Technology Project (2012 - 2012)



## Technology Maturity (TRL)

Start: **3**  
Current: **4**  
Estimated End: **4**



## Technology Areas

### Primary:

- TX01 Propulsion Systems
  - └ TX01.2 Electric Space Propulsion
    - └ TX01.2.2 Electrostatic

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System